The Nes Silicon Steel.

Considerable interest has lately been excited by the announcement that a new manner of making steel has been discovered, which, on account of its cheapness and simplicity is likely to cause some great changes in the steel and iron business of this country. This new article is called "Silicon Steel;" and it is claimed for it that it is an entirely new product, differing very materially from any steel heretofore known to commerce. Dr. Charles M. Nes is the discoverer of the remarkable properties of the silicon ore used in the manufacture of this new steel, and the circumstances of his discovery are so romantic that we quote the following account from the *Rome Sentinel* of Jan. 9th:

Dr. Chas. M. Nes, a prominent practicing physician of York, Pa., being called to see a lady who had been struck by lightning, was led to investigate the cause of the attraction of electricity to that particular spot, and found by examination that the electricity had passed down the chimney, thence to a corner of the room where stood a double barreled shot gun, which it had melted down, thence out in the yard to the dog kennel, striking and melting the iron chains with which the dog was secured, and killing him. On examining the melted metal, the doctor was astonished to see the perfect purification and crystalization which had taken place, and conceived the idea of making steel by subjecting the iron while in a molten state to currents of electricity. While thus experimenting, with good results, he was one day hunting on a range of rounded, sloping hills on the Codorous Creek. He shot a pheasant, and stooping to pick it up, discovered a small piece of ore resembling in appearance the melted gun barrel and chain, having the same crystalization and purification. The similarity was so marked that he was led to examine and test its qualities, which he found highly magnetic. He melted some of the ore in a crucible, and ran out a button of very fine steel, which, on being analyzed, was found to be silicon steel, an entirely new product in the steel line, from which the ore derived its name of "Silicon Steel Ore." This led to other and more important experiments, among which was the puddling of 15 or 20 per cent of this ore with common pig iron, in an ordinary puddling furnace. It was surprising to find, as the result, an excellent quality of silicon steel. From that time to the present, he, together with several other scientific and practical men, has thoroughly investigated the whole subject, until it has become clearly and unmistakably established that the mixture of this silicon ore with common iron will produce a quality of steel superior to any in the known world, and at an expense only a trifle above ordinary iron.

Having read the above and some other accounts of the discovery of Dr. Nes, we went a few days ago, to Rome, N. Y., where "The Nes Silicon Steel Co." have established the manufacture of the steel for the express purpose of exhibiting the process, and spent several hours in examining the works and methods. Mr. E. Gulick, the manager, extended to us every facility in his power for informing ourselves, and gave us samples of the ore and manufactured products.

The process of working is briefly this: The silicon ore is first crushed into a coarse powder, then put through a refining furnace, where it is melted and run off into plates of hard metal an inch or two in thickness. Then certain proportions of this hard metal are put into an ordinary puddling furnace with common pig iron, and the whole melted. The silicon makes a very excellent flux in itself, and when this mixture has cooked long enough it "balls up," and is hammered into short square "blooms" under a steam hammer. By using from 3 to 8 per cent of silicon ore with common pig, the iron is merely purified; but if the silicon ore is increased to 15 or 20 per cent, the product is found to be steel of good quality. The "blooms" from the steam hammer can be rolled or hammered into any desired shape. The simplicity of the process is really astonishing. You have but to melt up your materials in certain proportions in any furnace, crucible, or pot you choose, and hammer out a good steel product. None of the expensive special fixtures required in making other steels are needed in making the "Silicon."

We brought home a sample of the refined iron made by this process, and also a piece of the steel. The iron (1 in. diameter, round) we bent double when cold without making a crack on the outside of the bend. It has a fine grain and finishes nicely. Of the steel, we made a "cold chisel." It tempered well, and holds its edge very well indeed. We shall test it further as to its fitness for springs, fine tools, etc. One peculiar property claimed for this steel is that, when polished, it will not rust. The silicon steel has already been tried as a cap to rails. There are said to be now ten thousand tuns of these rails in use on the Erie railway, and thus far with good results. Although the discovery and its consequent enterprises are too young yet to have determined their real worth compared with the old methods, still we are favorably impressed by it and have considerable faith that it will help us in the future.—*Oneida Circular.*

NEW VARIETY OF CUCUMBER.—In *Land and Water* we have a figure and description of what is called the new white spine cucumber. This, when raised on a trellis, grows to an enormous size, one vine having three specimens, each of them three feet in length, besides many others over two feet long. The flesh is said to be very solid, with but few seeds, and the flavor very fine. This method of growing cucumbers is recommended as furnishing a much superior result to that of allowing them to trail on the ground, as they thus grow finer, straighter, and with a larger yield. This new cucumber has the skin perfectly smooth. It is very short in the neck, and it is considered a decided gain to the resources of the vegetable gardener.

Krigar's Cupola Furnace.

Smelting iron in a cupola furnace appears to most people, who see it daily done at every foundery, the simplest thing in the world; it is, however, not so, if due regard is taken to economy and good quality in casting. In a common cylindrical cupola, three essential parts may be distinguished. The upper half or body of the furnace prepares the pig iron and lime which, together with coke, are thrown in at the top for smelting in the middle part or crucible, which is somewhat narrower and provided with numerous nozzles for the introduction of blast, whence the molten iron, together with slag, runs down to the lower part, or hearth, where it collects until it is tapped. When such a furnace is to be started, it is filled to about two thirds with coke and one third with coke and iron; fire is then introduced and the blast turned on, when the molten iron collects in the hearth and replaces the coke of the same. Here it necessarily takes up impurities from the coke and impregnates the latter so much that it cannot be destroyed by the blast; and when the iron is tapped, masses of coke and half melted iron, which are not any longer supported, tumble down in the hearth where they are imperfectly burnt or melted, and cause the iron which collects there to become cold and sticky. These irregularities take place after every tap, and it generally happens that iron, which was at first fluid and gray, suddenly becomes thick and white, and unsuitable for the castings intended. In order to avoid this, Henry Krigar, of Berlin, constructs his cupola so that the lower part, or hearth, is not below the crucible, but by its side, and connected with it by a slanting canal, which is about 3 in. high, 6 to 8 in. long, and as wide as the cupola. This arrangement prevents any coke or half melted iron from falling down in the hearth, which is only accessible to melted iron and slag, and forms for them a kind of sump or receiver, which in no way interferes with the regular working of the two upper parts of the cupola. This very simple construction has proved highly successful, and its great advantages are a saving of fuel, a uniformly hot and liquid iron, and an increased yield per diem, as the regular smelting operation is never interrupted. Kregar's cupola can, therefore, be recommended not only to founderies, but also to Bessemer works, and to such forges as use the Danks puddling furnace with liquid iron, as a uniform heat and quality of each charge are essential for their success.—*Engineering.*

Carbonic Acid.

It is often stated as one of the wonders of plant life, that plants are ablo to do what the chemist has failed to do, that is, to decompose carbonic acid.

While it is extremely difficult to decompose carbonic acid, completely separating it into carbon and oxygen, nevertheless it is quite easy to partially decompose it. If we pass a stream of the gas through a tube containing red hot coals, the coals are burnt at the expense of half the oxygen contained in the carbonic acid, and carbonic oxide is the result. Hydrogen, iron, and zinc act similarly towards it, abstracting half its oxygen.

Potassium burns in it with a red light, producing carbon and carbonate of potassium. This experiment may very readily be shown to a class by taking a tube about three fourths of an inch in diameter and ten inches long, bent at right angles near the upper end, which is sealed in the lamp. A piece of potassium about the size of a pea is introduced into the tube, which has been previously filled with dry carbonic acid over mercury, as all aqueous vapors must be avoided; by inverting the tube, the potassium is lodged in the upper end of the bent portion. If it is now heated by a lamp, the first action is to expel a portion of the carbonic acid from the tube; as soon, however, as the potassium approaches a red heat, it takes fire and burns vividly, completely absorbing the carbonic acid, if it is present in sufficient quantity. Sodium also decomposes carbonic acid, but without taking fire. In the presence of the alkalies at red heat, phosphorus and boron have the same action.

Canned Fruits.

The impression prevails among those who use freely fruits which are put up in tin cans, that they are injured thereby, and this impression is in many cases correct. We have long contended that all preserved fruits and vegetables should be stored in glass, and that no metal of any kind should be brought in contact with them. All fruits contain more or less of vegetable acids, and others that are highly corrosive are often formed by fermentation, and the metallic vessels are considerably acted upon. Tin cans are held together by solder, an alloy into which lead enters largely. This metal is easily corroded by vegetable acids, and poisonous salts are formed. Undoubtedly many persons are greatly injured by eating tomatoes, peaches, etc., which have been placed in tin cans, and we advise all our friends who contemplate putting up fruits the present summer to use only glass jars for the purpose.—*Boston Journal of Chemistry.*

INFLUENCE OF FOOD UPON POULTRY AND EGGS.—The influence of the food of poultry upon the quality and flavor of their flesh and eggs has not generally been taken into consideration; but it is now well ascertained that great care should be exercised in regard to this matter. In some instances, it has been attempted to feed poultry on a large scale in France on horseflesh, and, although they devour this substance, very greedily, it has been found to give them a very unpleasant savor. The best fattening material for chickens is said to be Indian cornmeal and milk; and certain large poultry establishments in France use this entirely, to the advantage both of the flesh and of the eggs.

Official List of Patents.

In consequence of the holiday at the Patent Office on Decoration Day, the list of patents dated May 28th, had not reached us at time of going to press. It will appear in our next issue.

TIN IN NEW SOUTH WALES.—Tin has been discovered in the northern portion of New South Wales. The localities in which deposits have been discovered are at present confined to the Macintyre river, where deposits of ore, mixed with alluvium and of stream tin, have been struck over an area of 10 miles by 12, and to the Oban district, on the first fall from the high table land of New England down to the Clarence river. In the latter locality, it has been almost exclusively stream tin which has been hit upon.

TELEGRAPH BETWEEN SCOTLAND AND CANADA *vid* ICELAND.—The Danish war steamer *Fylla*, which sailed some days ago from Copenhagen for the Faroe Islands and Iceland, has been ordered by the Danish Government to take soundings and survey landing places for the submarine telegraph line intended to connect Scotland, *vid* those islands, with Canada.

ERRATUM.—On page 322, current volume (No. 21), we described the proprietor of Motz' expansive pivot as Michael M. Motz, Woodward, Center county, Pa. It should be Mitchell & Motz, at the same address.

Notes & Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.]

1.—RECOVERING SILVER FROM WASTE SOLUTIONS.—I wish to know a practical method of reclaiming the silver from photographers waste, which consists of paper and the water from washings. I want to get it so that I can convert it into the nitrate.—C. O.

2.—TAPER STEEL RODS.—Will some one tell me the best and cheapest way to make round tapering spring steel rods, three feet long, diameters at ends three thirty-seconds and six thirty-seconds of an inch?—A. B. K.

3.—LIQUID FUEL.—Is there any kind of liquid fuel in use, by which I could make steam for a two horse engine?—J. B.

4.—ECCENTRIC WHISKERS.—What is the cause, or what will prevent, whiskers breaking off where they appear to eat through and turn white at the ends as if they had been singed?—A. S. R.

5.—PHOSPHORESCENT OIL.—Will some one inform me if there is any means of rendering oil or any other fluid permanently and continuously phosphorescent, if it is, at the same time, sealed air tight? If the phosphorescence would continue six months or a year, it would answer my purpose; but it must not require agitation or a heat of above 95° Fahr. to produce it.—H. W. B.

6.—PROPAGATION OF ROSES.—Will some one inform me if, by taking a hardy rose bush and budding other hardy varieties to it, it will prove a success? I should like to know how it is done, and the best time to do it.—B.

7.—MITRAILLEUR.—In Luttrell's "Diary," under date January 1690, mention is made of an expedition being fitted out against Ireland, and amongst the munitions taken are "four of the new invented wheel engines which discharge 150 musquet balls at once, and, turning the wheel, as many more; they are very serviceable to guard a passe." Does history repeat itself in this instance, and is this the forerunner of the Gatling and mitrailleur guns of all kinds?—S.

8.—CONDENSER WITH RHUMKORFF COIL.—How is a condenser connected with a Rhumkorff coil? As I understand it, I connected the opposite coats of the condenser with the opposite sides of the contact breaker. It increases the spark, but I cannot keep the break working. It will stop after a few vibrations and requires an impulse with the finger to start it and soon stops again. When the condenser is not connected, the brake operates perfectly. The contact points are tipped with platinum. I tried gold tips with the same success. The coil I made myself. I use five or six Grove's cells for battery.—S. G. S.

9.—TRANSFERRING MOTION.—I wish to run a small circular saw (24 inch) with a turbine water wheel. Is there any objection to putting a drum on the vertical wheel shaft and running a half twist belt from it to a horizontal shaft from which to drive the saw, instead of using cog wheels to turn the angle?—W. F. W.

10.—ACTION OF RUNNING WATER ON LEAD PIPE.—The water used for drinking purposes, in my house, is conducted from a spring in the ground through about 1,000 feet of three quarter inch lead pipe. The water is constantly running, and has a fall of about four feet. I wish to know if the water may be poisonous, or if any of the lead is decomposed by the action of the water in flowing through the pipe?—G. G. E.

11.—WATERPROOFING MUSLIN.—How can I make a light muslin tent waterproof without painting or oiling it? I wish to use this tent in all kinds of weather, and wish it to be light, so as to be easily carried.—W. H. J.

12.—FORCE OF FALLING BODIES.—We have a steam hammer weighing exactly three tuns, including piston and rod; the stroke is four feet, and the hammer falls by its own gravity. What will be the force of the blow, making no allowance for friction? What is the formula for the calculation?—J. E.

13.—SPECTACLES.—Can any of your readers inform me if there is any article in use that is better suited to the human eyes than spectacles, and if the articles called "eye sharpeners" have proved a success or not?—J. Y.

Facts for the Ladies.—Mrs. E. A. Mac Rae, Shoe Heel, N. C., has used her Wheeler & Wilson Lock-Stitch Machine since 1857 with perfect success in every respect, stitching the clothing for 30 colored servants and a large family of whites, and army clothing and hospital bedding during the war, without the slightest repair. It is now as good as when bought. See the new Improvements and Woods' Lock-Stitch Ripper.

"Burnett's Cooking Extracts.—The best kinds extant."—*Sears' National Review.*

Answers to Correspondents.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at 1·00 a line, under the head of "Business and Personal."

ALL reference to back numbers must be by volume and page.

A. C.—It would not be a bad idea for you to advertise your articles in the SCIENTIFIC AMERICAN. You will find it to be a good investment.

MINERAL SPECIMEN.—To W. M. F.—Your specimen is subacetate of lead with some carbonate.

UNIT OF MEASURE.—To L. W. S.—Your suggestion, that a measure derived from the diameter of the sun should be used, can hardly be called novel. The French metric system is based upon the magnitude of the earth, the meter being the forty millionth part of the estimated circumference measured over the poles; and all the French measures of surfaces and solids, as well as the weights, are calculated from the lineal meter, which is 39·37079 inches, nearly.

PHOSPHATE OF CHALK.—A. H. C., in SCIENTIFIC AMERICAN, May 4, asks how the phosphate of chalk, used in Holmes' signal, is prepared. No such thing as a phosphate of chalk exists; nor is phosphate of lime, which, perhaps, he means, capable of being used in this signal. The substance used is phosphide of calcium. It may be prepared by kneading slaked lime into small sticks like a lead pencil, igniting them, and passing phosphorus vapors over them, at the same time heating the lime. Care is required in this, as in all experiments with phosphorus, to prevent a conflagration.—J. S.

POISONOUS COLLARS.—S. K. should burn the collar and test the ash with sulphuretted hydrogen, or sulphide of ammonium. If much lead is used, as on many business and visiting cards, a drop of sulphide of ammonium produces a black stain.—J. S.

PARIS GREEN OR SCHWEINFURTH GREEN.—This is aceto-arsenite of copper. Mr. Charles Schofield, of Indianapolis, formerly a student in Swarthmore College, Pa., died last summer from inhaling a minute quantity of Paris green, while putting it on potato vines. The composition given in Dingler's *Polytechnisches Journal*, Vol. LII, page 271, is oxide of copper, 31·23 per cent; arsenious acid, 58·65, and acetic acid 10·06. It is thus written:

$$3CuO, AsO_3 + CuO, C_4H_3O_3.$$—J. S.

BLACK BOARD.—Query 17, May 4.—Take shellac varnish, lampblack, and flour emery, mix and apply with a camel's hair varnish brush. If too thick, thin with alcohol.—P. J. D.

POISONOUS COLLARS.—To S. K., query 1, page 330.—Boil a piece of collar in diluted nitric acid. Lead will be indicated by a yellow color on the addition of iodide of potassium, and by a black, on addition of hydrosulphuret of ammonium, or solution of sulphuretted hydrogen.—E. H. H., of Mass.

STAINING HORN.—E. C. S., query 7, page 330, may do this by immersing the horn in a solution of nitrate of silver, and then exposing it to sunlight. Or it may be steeped in a hot dilute solution of bichromate of potash, and then in a decoction of logwood. Staining the hands will entirely depend on their coming in contact with the dye or not.—E. H. H., of Mass.

DISSOLVING WOOL OUT OF MIXED FABRICS.—To J. S., query 12, page 330.—Muriatic and sulphuric acids are nearly useless for this purpose. Boil the rags in a mixture of one part of nitric acid and ten of water, or a little stronger. The cotton fiber, after drying, can be shaken out as dust in a willowing machine, leaving the wool behind ready for dyeing. This is the plan adopted in England and Germany for making "extract," and is used for mixing with wool in many manufactures. This prepared wool, however, will be found to have lost, to a great extent, its felting property.—E. H. H., of Mass.

CEMENT FOR TEXTILE FABRICS.—To E. F., query 18, page 330.—Use a solution of gun cotton in ether, that is, collodion.—E. H. H., of Mass.

REMOVING INK STAINS FROM PAPER.—To R. W. A., query 14, page 330.—The ease with which this is done depends on the composition of the ink. If, besides being a mere tanno-gallate ink, it also contains indigo, as most really first class inks do, it will be an impossibility to remove the stains without destroying the paper. Moreover, printing paper is sized very differently from writing or cheque paper. If the surface is well sized, it may be comparatively easy to obliterate the stains, but in the case of thick spongy printing or book paper, the ferruginous particles of the ink will be so incorporated with the substance as always to leave some stain, whether containing indigo or not. Best English inks contain indigo; hence their value as indelible writing fluids.—E. H. H., of Mass.

SUPERHEATING STEAM.—To R. H. E., query 1, page 354.—Steam cannot be so superheated in metal pipes without decomposition.—E. H. H., of Mass.

ANNEALING STEEL.—To U. E., query 5, page 330.—The best way I have found to anneal small pieces of steel is to take a piece of gas pipe, two or three inches in diameter, and put the pieces in it, first heating one end of the pipe and drawing it together, leaving the other end open to look into. When the pieces are at a cherry red heat, cover the fire with saw dust. Use a charcoal fire, and leave the steel in over night. H. C. R., of O.

HYDROGEN LAMP.—To L., query 13, page 330, current vol. 1st. If the tube emitting the gas does not point upwards, attach another piece of rubber tubing or an elbow of any other tube so as to allow a jet, of the gas to be tested, to flow into the uppermost part of an an inverted wide mouthed two or four ounce bottle. If the gas is making rapidly, or you can see from the lowering of the water in the outer jar that your bottle is probably full, still keeping the bottle inverted, as from the lightness of the gas it will stay in the inverted vessel, remove the bottle gently from the pipe or tube, and apply a lighted match to the lower open mouth of the bottle. If the gas explodes loudly, and no flame remains in the bottle, it is dangerous to light the lamp. If it merely takes fire, and a very light bluish flame plays about the bottle or in it for a few seconds, it is pure hydrogen, and then it is safe to light the lamp. 2d. If you make your hydrogen in a simple bottle or jar, allowing it to pass through a tube inserted in the cork, you cannot stop the formation of the gas by closing the tube. If you make it as J. S. directs on page 298, the apparatus is self regulating, making gas only as you use it out of the inner jar, though the cover of the outer jar must not fit air tight, and there had better be free communication from the surface of the liquid in the outer jar to the open air. 3d. An apparatus of the size J. S. describes, if used often, will need renewing in a very few days—in one or two days—unless you make the cork much tighter than can usually be done. It takes a very close joint to confine hydrogen.—S. H. B., of N. H.

NITRIC ACID STAINS.—To S. H. F., query 2, page 354.—These cannot be removed from cloth, though, if the acid was diluted, the color may be modified by the application of an alkali—say ammonia.—E. H. H., of Mass.

ACIDULATION OF ALE.—To W. H. C., query 4, page 354.—This is the result of the acetous fermentation. The alcohol in the ale, absorbing oxygen from the atmosphere, is converted into acetic acid. The prevention may be effected by excluding the air by a tight bung.—E. H. H., of Mass.

ELECTRO-DEPOSITION OF IRON.—Query 5, page 354.—I quote from Napier's "Electro Metallurgy": "Iron may be deposited from a solution of its sulphate in water with a few drops of sulphuric acid added. Use a weak solution and a small battery."—S. G. S., of N. Y.

NITRIC ACID STAINS.—Query 2, page 354.—Apply very carefully, to the nitric acid stain, *aqua ammonia*. Do not use the ammonia stronger than is necessary to remove the stain.—S. G. S., of N. Y.

VACUUM IN CASKS.—E. H. H., in reply to J. A. P., query 6, page 233, says the weight of the air is more than sufficient to hold up liquor in casks, if the liquor would only stick together; but the liquor slips sideways, and so, although the lighter of the two, comes to take the lower place. And does E. H. H. hold that a viscid liquor, like molasses, can be held suspended in pumps to better advantage, and of course at a higher level than water? The power of the air to resist the descent of the liquor can surely not be at a disadvantage from want of mobility of the particles upon one another, as compared with the particles of liquor. Is it not, rather, that what we call gravitation, as exemplified conspicuously in fluids, is a tendency to a vertical movement—that the air does not seek to enter in, but is forced up by a screw motion of the liquor, which screw motion is prevented when paper or other like firm material intervenes? The liquor, that would otherwise be upheld, descends by dint of a mechanical power, the screw, which is made up of the tendency to vertical motion and viscidity conjoined. The old doctrine that terrestrial gravitation takes a bee line towards the earth's center has, moreover, other phenomena opposed to it; witness the course in its descent of a bullet shot from an exactly vertical rifle. What if we add the variation, from a perpendicular, of the plummet suspended from the collar of a deep shaft?—X.

WIND MILLS.—In answer to several enquiries on this subject, I wish to say: The direct force of the wind acting on windmill sails is resolved into two forces, one acting in the direction of rotation, the other in that of the axis. This latter gives no mechanical effect, but, on the contrary, increases the pressure on the pivot of the wind shaft and causes loss of effect. Your mathematical readers can easily resolve the primary force into its resultants, and calculate the best angle of impulse for the maximum effect, etc. For the benefit of the general reader, who is not so fortunate as to possess these advantages, I give the results of theory and practice, sufficiently accurately for general purposes. In especial cases, requiring care, a competent person should be consulted. A mathematical and practical view of the case can be found in Weisbach's "Mechanics," Vol. II, from which the following *data* are condensed: A windmill sail consists of the arms or whips, the cross bars and clothing. The arm is divided into seven equal parts. The sail commences at the first point of division. The cross bar at this point is made equal to one of these divisions, or sometimes one sixth the length of arm. Each successive cross bar increases in length to the last or outermost, which is made from one third to two fifths the length of arm. The arms are not generally made the center line of the sail, but they divide them so that the part next the wind equals from one fifth to one third of the entire width of sail. Owing to the greater velocity of the sails at their outer ends, the angle of impulse here should be greater than near the center. If the cross bars are put on the arms, commencing at the first division next the center, so as to make the following angles with the direction of the wind or, which is the same thing, the axis of rotation, 63½°, 70°, 74½°, 77½°, 79½°, 81°, 82°, the result will approach a maximum sufficient for ordinary cases. The best velocity at their periphery is 2½ times that of the wind. The power of the machine will vary so greatly that no definite area of sail can be given for a certain power. If actual work is to be done, it is better to always have power enough and to spare, in this as in everything else where power is required. I would suggest no less than 150 square feet of sail to each horse power.—C. A. L., of Tenn.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per Line will be charged.